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ABSTRACT

Even though attrition presents a serious threat to the validity of longitudinal research, there is a lack of standardization for reporting it. To examine the effectiveness of four tests for attrition -- two for external validity and two for internal validity -- the tests were applied to two large scale projects: the first, Project HASP, is a smoking, alcohol, and marijuana prevention project implemented with a high school population; the second project (TAPP) is a tobacco and alcohol intervention project conducted with a junior high school population. The first test examined differences in pretest scores for drop-outs and stayers. Results showed that those identified at pretest as using tobacco, alcohol, or marijuana were over represented among drop-outs. Sex, age, and ethnic differences were also found, suggesting questionable external validity for both studies based on this test. The second test addressed attrition among those for whom multiple test data were available. Both projects showed the least likely group to drop out were the continuing non-users. Since treatment occurred between survey times, this finding suggests program generalizability may only apply to those who were relatively stable non-users. The third test assessed differential rates of attrition among conditions. Since attrition for the control group in Project HASP was high, it is possible that attrition masked actual program effects such that significant findings did not emerge. No differential attrition by treatment was observed between conditions in Project TAPP. The final test examined drop-outs' differential rates of behavior among conditions. For Project HASP there was no differential attrition among conditions by any particular substance-using group; in Project TAPP attrition by smokers and drinkers was roughly equally distributed between the experimental and control groups. The absence of a sure correction of attrition artifacts suggests researchers should take positive steps to prevent attrition if possible, and, at a minimum, report potential artifacts as proposed in these tests. The four tests provide a means for the research community to assess the weaknesses and strengths of prevention programs. (JAC)

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ATTRITION IN PREVENTION RESEARCH

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ATTRITION IN PREVENTION RESEARCH

During the past decade, the number of longitudinal intervention projects has increased dramatically, particularly in the preventive health research arena. The aim of this research, to assess the long term impact of programatic treatment, is typically well suited to longitudinal studies since behaviors of interest are understood best when examined over relatively long time periods. Typical examples of this research include programatic efforts to reduce the onset of cigarette smoking among adolescents (e.g., Botvin et al, 1980; 1982; Evans et al, 1978; Evans et al, 1981; Hurd et al, 1980; Lupeker et al, 1983; Flay et al, 1983; McAlister et al, 1980).

Given the inherent pitfalls associated with large scale community research, most projects devote a great deal of attention to reducing threats to internal and external validity through the use of well thought out experimental designs. At least one program (Flay et al, 1983) has randomly assigned schools to conditions in a way that approached a true experimental design, thus eliminating many sources of experimental error and bias. While experimental designs have become more sophisticated, attrition has been largely ignored in published reports of these studies, or treated only in a cursory manor which does not allow an assessment of this threat to internal and external validity. Since attrition is not controlled by experimental design, it is perhaps the weakest link in longitudinal research (Cronbach, et al, 1980; Riecken and Boruch, 1974).

How attrition affects internal and external validity has been described elsewhere (Jurs and Glass, 1971) and is easily understood. When those who

can be followed throughout an evaluation are different than those who can not, generalizability of the study is limited. If smokers who are prone to be deviant are also prone to drop out of a study, we may have a program that can be said to work -- but only with non-deviant youths, the ones who probably need the program least.

The internal validity of a study is challenged should a treatment by attrition interaction occur. For example, if smokers are found to drop out of treatment groups at a disproportionately high rate, a program may appear to be wonderfully successful, a finding which may be totally spurious. The opposite, i.e. smokers dropping out of control groups at high rates may serve to mask the true effectiveness of a program by creating an outcome in which treatments and controls are ostensibly not different from each other.

One of the reasons previous researchers have failed to do more than report basic rates of attrition may have to do with a lack of standardization about reporting attrition. The purpose of this paper is to suggest four tests for attrition -- two for external validity and two for internal validity -- that may be used in a standardized way throughout the field. For purposes of clarification, the four tests will be applied to two large scale research projects with which the authors are affiliated. The first, Project HASP is a smoking, alcohol and marijuana intervention project implemented on a high school-age population. Of 4,972 subjects surveyed at wave 1, 3,227 (65%) were resurveyed at wave 2 and 2,298 subjects (46%) were resurveyed at wave 3. Wave 2 occurred four months after wave 1; wave 3 occurred one year after wave 2. The second project (TAPP) is a tobacco and alcohol intervention project conducted with a junior high school population. Of 1,720 subjects identified at pretest, 1,402

(82%) were resurveyed seven months later at the initial posttest. At wave 3 which occurred one year after wave 1, 1,296 (75%) subjects were resurveyed. Thus, both studies had a fair amount of attrition in terms of the proportion who were absent from measurement a year or more after initiation of data collection.

TESTS OF ATTRITION

Tests of attrition are designed to answer four specific research questions:

1. Are pretest scores for drop outs and stayers different? (external)
2. Are observation 1, observation 2 change scores different for drop outs and stayers? (external)
3. Are there differences in rates of attrition among conditions? (internal)
4. Are pretest scores for drop outs different among conditions? (internal)

Dependent variables for tests 1, 2 and 4 should be identical to those variables used as tests of program efficacy at a minimum and may be expanded to include demographic and other variables as well.

TEST ONE

Results of test one for Project HASP are presented in Table 1. As can be seen, five of six analyses on primary dependent pretest variables (tobacco, alcohol and marijuana) yielded differences for those who were present and absent at waves 2 and 3. For all three substances at both observations, those identified at pretest as using tobacco, alcohol or marijuana were over represented among drop outs. Drop outs also tended to be male (53% at wave 2; $\chi^2 = 6.2$; $df = 1$; $p < .0001$).

Insert Table 1 about here

Pretest scores for drop outs and stayers in Project TAPP were also significantly different, but only for tobacco users and wave 2 alcohol users although the same trend for drinkers to be over represented among drop outs also persisted at wave 3 (see Table 2). Unlike Project A, attrition was not related to subject gender at wave 2 ($\chi^2 = 2.67$; $df = 1$; $p > .10$) or wave 3 ($\chi^2 = 0.1$; $df = 1$; $n.s.$). Age was related to attrition with drop outs being one month older on the average at wave 2 ($F = 17.6$; $df = 1, 1718$; $p < .00001$) and wave 3 ($F = 16.7$; $df = 1, 1718$; $p < .00001$). Ethnicity was assessed in this project and proved to be marginally predictive of attrition at wave 3 ($\chi^2 = 10.3$; $df = 5$; $p < .07$) although it did not discriminate at wave 2 ($\chi^2 = 5.1$; $df = 5$; $n.s.$). The largest dropping out ethnic group being black (34.8%) followed by American Indian (32.4%), white (23.5%), Hispanic (20.2%), and Asian (18.7%).

Insert Table 2 about here

For both studies there is questionable external validity based on this test.

TEST TWO

The second test addresses the issue of attrition among those for whom multiple test data are available. For both projects, rudimentary change scores were calculated for subjects present at waves 1 and 2. Four behavior patterns were included based on whether or not subjects used target substances at wave 1 and whether or not they used at wave 2. Results of this test for Project HASP are presented in Table 3. For all three substances, those who were non-users at waves 1 and 2 were less likely to drop out at wave 3. Continuing users (those who smoked cigarettes, drank alcohol, or used marijuana at waves 1 and 2)

were the most likely group to drop out. Of particular interest, those who did not use at wave 1 who began using at wave 2 were also quite likely to drop out compared to continuing non-users.

Insert Table 3 about here

A similar analysis for Project TAPP yielded significant results for tobacco but not alcohol (see Table 4). Like the other project, the least likely group to drop out were the continuing non-users. Unlike Project A, subjects who were continuing smokers were only at slightly elevated risk for dropping out. Those who either began or quit smoking between waves 2 and 3 were the most likely subjects to drop out.

Insert Table 4 about here

Since treatment occurred between waves 1 and 2 in each study, these results suggest program generalizability may only apply to those who were relatively stable, non-users. Generalizability to those who use or who are in transition is questionable.

TEST THREE

The third test assesses differential rates of attrition among conditions. Results of this test for Project HASP are displayed in Table 5. For both waves 2 and 3, there was differential attrition among the five conditions in this

project. While the details of the conditions for purposes of this paper are irrelevant, it is important to know that conditions 1 through 4 received variations of a treatment while condition 5 was a control. The greatest attrition in conditions 3, 4 and 5 while conditions 1 and 2 had moderate attrition. Since attrition in the control group is high, it is possible in this study that attrition may even be masking actual program effects such that significant findings may not emerge which may have otherwise been observed.

Insert Table 5 about here

As table 6 attests, no differential attrition by treatment was observed between conditions in Project TAPP.

Insert Table 6 about here

TEST FOUR

The final test examines drop outs' differential rates of behavior among conditions. Results of this analysis for Project HASP (see Table 7) suggest there was no differential attrition among conditions by any particular substance using subgroup. Attrition by smokers, drinkers and marijuana users is dispersed rather evenly among conditions and thus a major threat of attrition can be dismissed.

Insert Table 7 about here

Results of a similar test for Project TAPP are presented in Table 8. Attrition by smokers and drinkers at waves 2 and 3 was roughly equally distributed between the experimental and control group.

Insert Table 8 about here

DISCUSSION

Attrition presents social researchers with a perplexing conundrum. On the one hand, in an otherwise well designed study in which threats to internal and external validity are controlled by random assignment, differential attrition can still serve to invalidate any promising findings obtained. On the other hand, attrition defects are not correctable by means of replacement strategies (e.g., Lord, 1967; 1969) or covariance analyses (Cronbach and Snow, 1977). Attempts to correct by such techniques typically over or under correct for the true effect attrition may have and in the final analysis, fails to restore either internal or external validity (Cronbach et al, 1980; Riecken and Boruch, 1974).

The absence of a sure fire correction for attrition artifacts suggests researchers should take positive steps to prevent attrition if possible and at a minimum report potential artifacts in the way proposed in this paper.

Preventing Attrition

Many things apparently beyond the control of the researcher can in fact be dealt with successfully if adequate plans exist before a project begins. One strategy for reducing the impact of attrition involves a second effort to reach subjects who may be absent at any particular posttest. On the part of the

researcher, this requires the establishment of a systematic method for identifying and recontacting drop outs. In Project SMART, a multiple substance drug abuse prevention project currently under way at the USC, Health Behavior Research Institute, we have access to names, addresses and telephone numbers of subjects if we need to know them in order to follow-up on drop outs. Access to this information was difficult to obtain since human subjects committees of the university and school district needed to be satisfied. Only after strict confidentiality protection was guaranteed, was permission to track drop outs obtained. However, without such efforts, the threats posed by attrition to the study would be potentially devastating.

Reporting Attrition

Whether attrition is successfully prevented or not, requirements for documenting and reporting attrition should be mandated by the research community as a whole. Adopting the four tests described in this paper constitute a concise method of assessing potential threats to internal and external validity. In order to use such tests, of course, adequate subject tracking procedures need to be implemented. Randomly sampling subjects at posttest does not suffice as an alternative to tracking since no assessment of effects due to attrition is possible.

Conclusion

It is in the interest of prevention researchers to assess and report the weaknesses of their research. Attrition remains a major source of experimental invalidity. The four tests described here provide a means for the research community to gauge its progress and assess the weaknesses and strengths of prevention programs.

REFERENCES

1. Botvin, G., Eng, A., and Williams, C. Preventing the onset of cigarette smoking through life skills training. Prev. Med., 1980, 9, 135-143.
2. Botvin, G. and Eng, A. The efficacy of a multicomponent approach to the prevention of cigarette smoking. Prev. Med., 1982, 11, 199-211.
3. Cronbach, L.J., Ambron, S.R., Dornbusch, S.M., Hess, R.D., Hornik, R.C., Phillips, D.C., Walker, D.F. and Weiner, S.S. Toward Reform of Program Evaluation. San Francisco: Jossey-Bass, 1980.
4. Cronbach, L.J. and Snow, R.E. Aptitude and Instructional Methods. New York: Irvington, 1977.
5. Evans, R.I., Rozelle, R.M., Mittelmark, M.B., Hansen, W.B., Bane, A.L. and Havis, J. Deterring the onset of smoking in children: Knowledge of immediate physiological effects and coping with peer pressure, media pressure and parent modelling. Journal of Applied Social Psychology, 1978, 8, 126-135.
6. Evans, R.I., Rozelle, R.M., Maxwell, S.E., Raines, B.E., Dill, C.A., Guthrie, T.J., Henderson, A.H. and Hill, P.C. Social modeling films to deter smoking in adolescents: Results of a three-year field investigation. Journal of Applied Psychology, 1981, 66, 399-414.
7. Flay, B.R., d'Avernas, J.R., Best, J.A., Kersell, M.W. and Ryan, K.B. Cigarette smoking: Why young people do it and ways of preventing it. In F. McGrath & P. Firestone (Eds.), Pediatric and adolescent behavioral medicine. New York: Springer-Verlag, 1983.
8. Hurd, P.D., Johnson, C.A., Pechacek, T., Best, L.P., Jacobs, D.R. and Luepker, R.V. Prevention of cigarette smoking in seventh grade students. Journal of Behavioral Medicine, 1980, 3, 15-28.
9. Jurs, S.G. and Glass, G.V. The effect of experimental mortality on the internal and external validity of the randomized comparative experiment. Journal of Experimental Education, 1971, 40, 62-66.
10. Lord, F.M. A paradox in the interpretation of group comparisons. Psychological Bulletin, 1967, 68, 304-305.
11. Lord, F.M. Statistical adjustments when comparing pre-existing groups. Psychological Bulletin, 1969, 72, 336-337.
12. Luepker, R.V., Johnson, C.A., Murray, D.M. and Pechacek, T.F. Prevention of cigarette smoking: Three-year follow-up of an education program for youth. Journal of Behavioral Medicine, 1983, 6, 53-62.

13. McAlister, A., Perry, C., Killen, J., Slinkard, L. and Maccoby, N. Pilot study of smoking, alcohol and drug abuse prevention. American Journal of Public Health, 1980, 70, 719-721.
14. Riecken, H.W. and Boruch, R.F. Social Experimentation: A Method for Planning and Evaluating Social Intervention. New York: Academic Press, 1974.

OVERALL N AND RATES OF ATTRITION

PROJECT A (HASP)

	<u>WAVE 1</u>	<u>WAVE 2</u>	<u>WAVE 3*</u>
N	4,972	3,227	2,298
% ABSENT	0	35	54

PROJECT B (TAPP)

	<u>WAVE 1</u>	<u>WAVE 2</u>	<u>WAVE 3</u>
N	1,720	1,402	1,296
% ABSENT	0	18	25

*WAVE 3 SAMPLES WERE CONSTRUCTED INDEPENDENTLY OF SUBJECTS' PRESENCE OR ABSENCE AT WAVE 2.

QUESTIONS FORMING THE BASIS OF
STANDARDIZED TESTS OF ATTRITION
IN LONGITUDINAL RESEARCH

TEST ONE - EXTERNAL

ARE PRETEST SCORES FOR DROPOUTS AND STAYERS DIFFERENT?

TEST TWO - EXTERNAL

ARE OBSERVATION 1, OBSERVATION 2 CHANGE SCORES DIFFERENT
FOR DROPOUTS AND STAYERS?

TEST THREE - INTERNAL

ARE THERE DIFFERENCES IN RATES OF ATTRITION AMONG
CONDITIONS?

TEST FOUR - INTERNAL

ARE PRETEST SCORES FOR DROPOUTS DIFFERENT AMONG CONDITIONS?

TABLE 1
RESULTS OF STANDARDIZED TEST ONE

PERCENT OF SUBJECTS WHO WERE PRESENT OR ABSENT
AT WAVES 2 AND 3 FOR PROJECT A WHO SMOKED CIGARETTES,
DRANK ALCOHOL, OR USED MARIJUANA

	SMOKED		DRANK		TOKED	
	<u>WAVE 2</u>	<u>WAVE 3</u>	<u>WAVE 2</u>	<u>WAVE 3</u>	<u>WAVE 2</u>	<u>WAVE 3</u>
ABSENT	19.15	18.70	59.44	60.96	36.67	36.59
PRESENT	11.76	9.32	57.67	55.23	27.47	23.85
	<u>=====</u>	<u>=====</u>	<u>=====</u>	<u>=====</u>	<u>=====</u>	<u>=====</u>
CHI-SQUARE (DF = 1)	46.6	82.9	1.4	16.2	43.2	91.6
SIGNIFICANCE	P<.0001	P<.0001	N.S.	P<.0001	P<.0001	P<.0001

TABLE 2
RESULTS OF STANDARDIZED TEST ONE

PERCENT OF SUBJECTS WHO WERE PRESENT OR ABSENT
AT WAVES 2 AND 3 FOR PROJECT B
WHO SMOKED CIGARETTES AND DRANK ALCOHOL

	SMOKED		DRANK	
	<u>WAVE 2</u>	<u>WAVE 3</u>	<u>WAVE 2</u>	<u>WAVE 3</u>
ABSENT	23.7	20.7	45.1	42.0
PRESENT	9.5	9.3	36.5	36.9
=====	=====	=====	=====	=====
CHI-SQUARE (DF = 1)	27.0	21.7	4.2	1.7
SIGNIFICANCE	P<.00001	P<.00001	P<.05	P<.20

TABLE 3
RESULTS OF STANDARDIZED TEST TWO

PERCENT OF SUBJECTS IN PROJECT A WHO DROPPED OUT
AT WAVE 3 WHO HAD VARIOUS PATTERNS OF WAVE 1 - WAVE 2
USE FOR TOBACCO, ALCOHOL AND MARIJUANA

SUBSTANCE	<u>WAVE 1 - WAVE 2 PATTERN</u>				<u>CHI-SQUARE*</u> <u>(DF = 3)</u>
	<u>NON-USE</u> <u>NON-USE</u>	<u>NON-USE</u> <u>USE</u>	<u>USE</u> <u>NON-USE</u>	<u>USE</u> <u>USE</u>	
TOBACCO	36.6	56.3	53.9	58.7	66.6
ALCOHOL	35.1	40.4	37.5	44.2	19.5
MARIJUANA	34.4	47.4	47.4	51.2	68.1

*ALL ANALYSES SIGNIFICANT BEYOND .0001 LEVEL.

TABLE 4
RESULTS OF STANDARDIZED TEST TWO

PERCENT OF SUBJECTS IN PROJECT B WHO DROPPED OUT
AT WAVE 3 WHO HAD VARIOUS PATTERNS OF WAVE 1 - WAVE 2
USE FOR TOBACCO AND ALCOHOL

SUBSTANCE	<u>WAVE 1 - WAVE 2 PATTERN</u>				CHI-SQUARE (DF = 3)
	<u>NON-USE</u> <u>NON-USE</u>	<u>NON-USE</u> <u>USE</u>	<u>USE</u> <u>NON-USE</u>	<u>USE</u> <u>USE</u>	
TOBACCO	16.4	33.3	33.3	20.4	22.2*
ALCOHOL	16.6	21.2	16.2	19.1	2.8**

*P<.0001

**N.S.

TABLE 5
RESULTS OF STANDARDIZED TEST THREE

DIFFERENTIAL ATTRITION AMONG CONDITIONS
FOR PROJECT A

CONDITION	PERCENT WHO WERE ABSENT	
	<u>WAVE 2</u>	<u>WAVE 3</u>
1 (EXP)	19	38
2 (EXP)	20	41
3 (EXP)	28	45
4 (EXP)	32	48
5 (CONT)	28	48
=====	=====	=====
CHI-SQUARE (DF = 4)	27.6	19.3
SIGNIFICANCE	P<.0001	P<.001

TABLE 6
RESULTS OF STANDARDIZED TEST THREE

DIFFERENTIAL ATTRITION BETWEEN CONDITIONS
FOR PROJECT B

CONDITION	PERCENT WHO WERE ABSENT WAVE 2	WAVE 3
1 (EXPERIMENTAL)	18.1	23.5
2 (CONTROL)	19.0	26.1
=====	=====	=====
CHI-SQUARE (DF = 1)	0.2	1.4
SIGNIFICANCE	N.S.	<.25

TABLE 7
RESULTS OF STANDARDIZED TEST FOUR

DIFFERENTIAL RATES OF BEHAVIOR OF DROPOUTS
IN FIVE CONDITIONS FOR PROJECT A

CONDITION	<u>PERCENT OF ABSENTEES</u>					
	<u>WAVE 2</u>			<u>WAVE 3</u>		
	<u>SMOKE</u>	<u>DRINK</u>	<u>TOKE</u>	<u>SMOKE</u>	<u>DRINK</u>	<u>TOKE</u>
1 (EXP)	18.6	58.8	33.8	24.4	59.6	39.0
2 (EXP)	11.5	60.9	34.1	17.0	67.0	37.2
3 (EXP)	21.0	52.3	40.2	18.5	62.7	36.4
4 (EXP)	14.3	59.2	28.6	17.6	66.1	36.1
5 (CONT)	21.0	63.5	39.9	18.9	62.1	37.7
=====	=====	=====	=====	=====	=====	=====
CHI-SQUARE (DF = 4)	5.9	4.8	5.0	3.0	2.9	0.3
SIGNIFICANCE	P<.25	P<.35	P<.30	P<.60	P<.60	N.S.

TABLE 8
RESULTS OF STANDARDIZED TEST FOUR

DIFFERENTIAL RATES OF BEHAVIOR OF DROPOUTS
IN TWO CONDITIONS FOR PROJECT B

CONDITION	<u>PERCENT OF ABSENTEES</u>			
	WAVE 2		WAVE 3	
	<u>SMOKERS</u>	<u>DRINKERS</u>	<u>SMOKERS</u>	<u>DRINKERS</u>
EXPERIMENTAL	25.3	48.2	24.6	43.2
CONTROL	21.8	42.4	16.4	40.7
=====	=====	=====	=====	=====
CHI-SQUARE (DF = 1)	0.1	0.4	1.9	0.1
SIGNIFICANCE	N.S.	N.S.	P<.20	N.S.